1273549

THE UNITED STATES OF AMERICA

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January 13, 2005

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APPLICATION NUMBER: *60/484,753*
FILING DATE: *July 03, 2003*
RELATED PCT APPLICATION NUMBER: *PCT/US04/19042*

Certified By

Jon W Dudas

Under Secretary
of Commerce for Intellectual Property
and Acting Director of the
Unites States Patent and Trademark Office

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(b)(2).

Docket Number		Type a plus sign (+) inside this box →	+
S259 1010.P1			

INVENTOR(s)/APPLICANT(s)			
LAST NAME	FIRST NAME	MIDDLE INITIAL	RESIDENCE (CITY AND EITHER STATE OR FOREIGN COUNTRY)
Murphy	Robert		Winston-Salem, North Carolina

TITLE OF THE INVENTION (280 characters max)

Boat Handling System

CORRESPONDENCE ADDRESS

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STATE	ATLANTA, GEORGIA	ZIP CODE	30357-0037	COUNTRY	USA

ENCLOSED APPLICATION PARTS (*check all that apply*)

☒ Specification *Number of Pages* 10		
☒ Drawing(s) *Number of Sheets* 24 ☐ Other (specify)_____		
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT (*check one*)		
☒ A check or money order is enclosed to cover the filing fees	FILING FEE AMOUNT ($)	$80.00
☒ The Commissioner is hereby authorized to charge any deficiency in fees or credit any overpayment to Deposit Account Number: 09-0528.		

☒ Pursuant to 37 C.F.R. § 1.27, applicant hereby asserts small entity status.

The Invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,

SIGNATURE D. Scott Sudderth Date 07/03/03

TYPED or PRINTED NAME D. Scott Sudderth REGISTRATION NO. (*if appropriate*) 34,026

Certificate of Express Mailing

I hereby certify that this document is being deposited as Express Mail in an envelope addressed to Mail Stop Provisional, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on 7/3/03, Express Mail No. _____,

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ATLANTA 360986v1

BOAT HANDLING SYSTEM

Background of the Invention

There is presently no safe, efficient system which allows military and commercial ships to deploy service, maintain, retrieve and exchange data with smaller vessels. The trend in marine and aquatic military operations is one where large vessels will have an increasing need to deploy smaller vessels, particularly unmanned ones for a variety of purposes. Further, safety requirements for naval assets in a climate of terrorist attacks [chem/bio/explosive] are such that systems are needed whereby a large vessel can safely handle and exchange data and materials with other vessels under a variety of conditions. Safety requirements for military and commercial applications are such that increasing the stand-off distance between large and small vessels is of major importance. Using the USS Cole as an example, small vessels that contain explosives and are closely-coupled with a larger vessel at the waterline can exact an extreme amount of damage, particularly below the waterline. As the distance between a smaller vessel and a larger one increases, the forces which can be transmitted rapidly decrease geometrically to insignificance.

The advent of new types of remotely-operated systems dictates entirely new types of handling systems which will operate under extreme conditions [including but not limited to speed, sea state, weather, darkness, and enemy fire]. New types of remotely-operated vessels

come in a variety of types and sizes ... from tons to ounces. It is impractical to use conventional handling systems [e.g. cranes and davits] for new devices and the use of separate handling systems for each new vessel employed by military or commercial means is highly undesirable. Large ships are very expensive and their design and manufacture is a lengthy process. The large ship duty cycle can run for decades yet smaller vessels change much more rapidly and a new design can be in service within months or years. Also, smaller vessels' obsolescence and replacement takes place over a much shorter period than a larger vessel.

The US military is currently "locked" into using old systems because the cost of upgrades is exorbitantly-high. Rapidly-changing technology dictates that handling systems must be modular [large and small vessels] and upgradeable to new systems, yet remain backwards-compatible to old systems. This invention is capable of handling diverse applications ranging from a slow-moving row boat to a high speed, autonomous vessel. This invention is capable of handling vessels with speeds that exceed that of the mother ship/object.

Physically contacting or deploying/recovering a small vessel or object fixed to the shore or bottom is problematic due to the physical characteristics of the water and vessels, particularly when the vessels are of disproportionate size. Being a fluid medium, the water has current, tides and wave motion at the air/sea interface which regularly manifests itself as periodic, generally periodic, or irregular and chaotic. The mass and displacement characteristics of a larger vessel compared to a smaller one exacerbate differences in motion. While two vessels may be in the same body of water, the ambient conditions will often be different even at proximal locations. While a large vessel of 1,000 tons might roll gently at a certain sea state, a smaller vessel might rise and fall, pitch and roll at several hundred percent of its length, height or width. Further, the relative motion between large and smaller vessels is localized, affected by the vessels themselves

AND will be significantly affected by any recovery device or mechanical connection between a smaller or larger vessel.

Description of the Invention

The invention is a computerized handling system with high speed open-sea operational capacity, able to deploy, dock and retrieve vessels from other ships while underway, and to describe an articulated, hydraulic, air or electrically-powered boom and a motion damping, range-extending umbilical operated sled. This boom would facilitate a "smart" and "flexible" forcing and locking system, which may use closed-circuit air, water, electromechanical and/or hydraulic pressure, or flows and vacuums of ambient air and water generated during operation to facilitate handling small vessels at flank ship speeds in calm or high sea states.

The system integrates passive or computerized systems with active mechanical means. The invention can entirely compensate for or dampen relative motion between the docking area of the handling system and the object or vessel which is recovered. Vessels can also be linked for data transfer or for a payload, personnel or fuel exchange.

The handling system is a tethered catamaran-like design capable of operation at above or below the water's surface. It may use ballasting for positive, negative or neutral buoyancy. Control surfaces which contact air and water are built into the structure and vectored air, like that of a hovercraft, may be used. This Ship's Small Vessel Handling System [SSVHS] may be man operated, remotely-operated or operate entirely autonomously. The design is scalable to various ship or boat sizes and is modular. The handling end can be ganged to receive more than one small vessel and a single handling module can be configured to adjust accordingly. SSVHS may be programmed to avoid collisions. Some examples of collision hazards include: other vessels

that are being retrieved, ships, bottom ground under the vessel, dry land, flora or fauna and other SSVHS's. The SSVHS design may be practically applied to retrieve any size craft under thirty-five feet. It also may be deployed at, under or above the water's surface and is suitable for ship-to-ship, ship-to-dock or ship-to-shore applications. The tethered "sled" configuration may contain propulsion systems or trim/leveling control surfaces like tabs, fins and rudders. SSVHS is a major improvement over other existing designs with advantages including ease of operation, extending the envelope for large ships retrieving small vessels and increased safety to ships and crews, protecting same from mechanical injury, explosions and biohazards. The design is adaptable to a multitude of military and commercial ships and docks and may be mounted on vessel deck, hull, shore, barge or buoy.

The craft being tethered generally will have an aerodynamically and hydrodynamically-shaped bow, keel and cradle sections for minimal presentation to the forces of water or configurable to facilitate vectoring the handling system. Also, located between the pontoons are structural and supporting devices for objects to be handled which are also capable of vectoring the system and trapping or ejecting functions. This craft will have trim and ballast liquid storage tanks mounted inside said pontoons for positive or negative buoyancy or trim functions, and the multiple locking mechanisms will have security functions and facilitate handling. Said handling system is capable of operating in either forward or aft directions, e.g. a vessel can enter it at speed from the rear, or, if the handling system is rotated 180 degrees, it can track and "scoop" propelled or non-propelled mechanisms or flora or fauna.

This invention includes a rapidly-reconfigurable, remotely-operated mating/docking/locking system which can transmit data and be shape coded, like a key, to receive almost any type of vessel or to repel entry. The mating/docking/locking system functions as a security

system in addition to trapping and stowage. Additionally, the system is active or passive and is adjustable. While still remaining locked in place as undeployable, crewmen can adjust the vessel's attitude ... allowing variable attitude adjustment [e.g. roll, pitch and yaw] of a constrained vessel by mechanical means, where the vehicle can be stowed, maintained and manipulated by technicians.. The vectoring/forcing/repelling/mating/locking system may use air, hydraulics, electromagnetism, water pressure, vacuum or friction to control the vessel to be recovered.

SSVHS enables aquatic military operations to be conducted more rapidly. Benefits of this include highly-increased efficiency and decreased exposure to enemy fire as well as decreased susceptibility to weather. SSVHS has built-in redundant systems for retrieval and can operate in modes which allow it to retrieve disabled smaller vessels from larger ones and to serve as a system to collect debris, buoys, humans, or aquatic flora and fauna. The multiple sensor & transmitter system on SSVHS serves to facilitate tracking, analyzing, mating and securing items that will be retrieved from a ship connected to SSVHS. It may also be augmented with an additional computer telemetry system on board the vessel or device to be retrieved. Usable data transmission links can either be wired, use optical fibers, or be wireless [Electromagnetic, Infrared or Laser]. Sensors located on SSVHS may be used in the retrieval process for positioning, mating and retrieval. They have multiple purposes and may be used to inspect vessels, refuel, materials, equipment, flora and fauna of unknown origin. This may be accomplished either on-board, remotely [on shore] or autonomously, and then compared with data stored in the SSVHS computer or remote data bases via Internet.

Benefits of this invention include:

Data - Secure [non wireless] data linking which provides virtual unlimited bandwidth and

preserves wireless battle space bandwidth;

Service - Remote refueling, servicing and hazardous payload exchange;

Carry/Transfer - Sick personnel or other personnel for maintenance or security and a variety of other purposes;

Transferring personnel and payloads ship to ship or ship to shore;

Incorporating lethal and non-lethal anti-personnel devices ranging from threat elimination to non-lethal restraints;

Open architecture and cross-service deployment;

Containment-boom and net deployment;

Examination and disarming/neutralization of devices which may be applied to potentially dangerous payloads [e.g. including, but not limited to, robotic arms, X-ray systems, sniffers, neutron activation/gamma backscatter or acoustic imaging systems for collecting data and EM pulse coils, high pressure water jets, mechanical shears, saws and rams, explosives or other disassembly. Also, deactivating or destructive devices for examination and neutralization of recovered items if required.

The invention provides an open architecture for computers and software and uses standard fittings and modular, regularly spaced, redundant connector/fasteners. This invention is intentionally designed to receive third party enhancements which would allow for upgrades, improvements, rapid repairs, web-connectivity, physical or computer-controlled rapid reconfiguration and obviating obsolescence.

1. A variable speed handling system for small craft and/or personnel or other materials on, under or near the surface of a body of water, said device is comprised of a catamaran design having a pair of pontoons in connection with a personnel deck and cradle system

so as to form a containment area between said pontoons.

2. A variable speed handling system for small craft and/or personnel or other materials on, under or near the surface of a body of water, said device is comprised of a craft comprising straight line hull sections for modular assembly and for enlarging or shortening width or length; or geometrically reconfiguring to conform to particular requirements.

3.

4. A handling system used to guide, trap and retrieve or deploy small vessels or materials or personnel. This handling system has a drive system for propulsion and steering or operating in a tethered mode through the water. When operating independently or when stabilizing, said handling system can be operated in a fixed or tethered mode from a boom.

5. The handling system is capable of being manually/computer-controlled from A. the handling platform itself, B. On board the mother vessel or any other location by human operators or autonomously, e.g. dry land or a dock, via encrypted, data handshaking and positioning software which uses a variety of sensors between said handling system and the vessel to be handled, or from any other remote computer.

6. The handling system incorporates a variety of physical configuration and sensor/software security features can be incorporated to facilitate or repel docking or unauthorized

boarding, which may be manually or computer-operated.

7. The handling system incorporates a variety of control surfaces which can, beyond vectoring the handling system or mother vessel, use water flow to facilitate or deter boarding by craft or personnel. E.g. an alarm mode can divert water to "flush" the system or activate anti-electronic or anti-personnel devices.

8. The handling system incorporates an umbilical which is capable of transmitting data or fuel or other materials from a mother to and from a subordinate vessel.

9. The handling system is "smart" and incorporates a computer and several sensors including, but not limited to:

magnetometers, sonar, OPS, inertial, radiation, neutron activation/gamma backscatter, biological sensors and other devices so that the handling system A. "knows where it is", B. where the mother is, C. where objects of interest are. The handling system includes arrays of such sensors and an on-board computer with appropriate software and is capable of locating objects of interest using 3D vision within a certain distance from the system itself. The handling system is capable of utilizing on-board hardware and software to maximize data acquisition geometry from sensors ... at, above, or below the water's surface.

10. The handling system incorporates a variety of forward-looking sensors, which can serve

to generate additional data for predictive programs to keep the handling portion of the system stable relative to: A. mother ship, B. the water, C. the vessel, personnel or material to be recovered, or any other determined reference point ... e.g. a relative but moving point below the surface of the water where movement is less than the movement at the water/air interface ... as in recovering any objects of interest which are on the surface, submerged, or airborne.

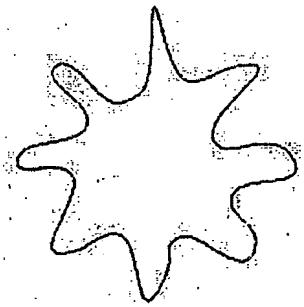
11. Said handling system is capable of interfacing with the helm of the mother vessel and, if required, for a payload of significance, it can control the helm [subject to human override] to facilitate recovery of an object of interest.

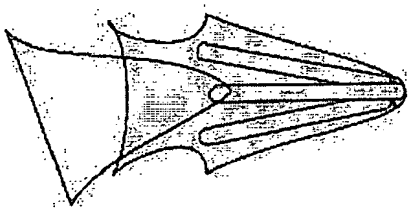
12. Said handling system incorporates a computer and supplemental software that is capable of predicting conditions expected to be encountered to shorten mechanical response time and facilitate handling

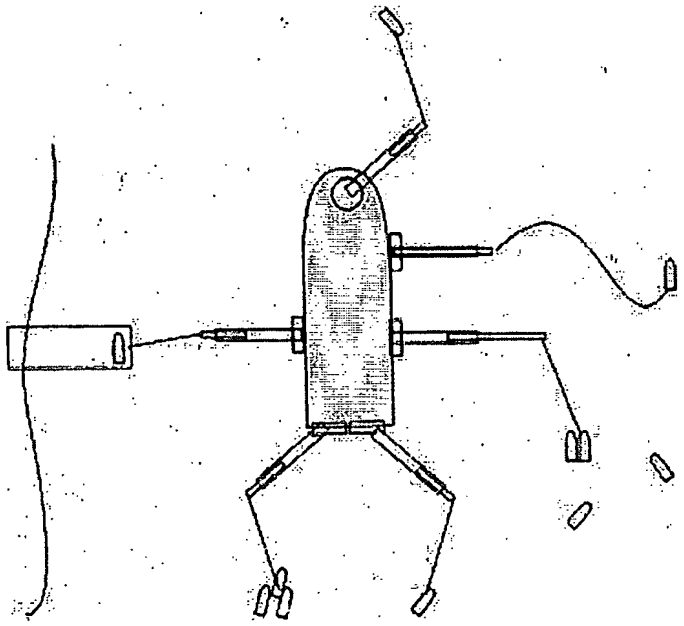
13. Said handling system incorporates modular connectors, modular open-architecture hardware and software and modular enclosures to accommodate a variety of hardware and software devices, whether proprietary or non-proprietary.

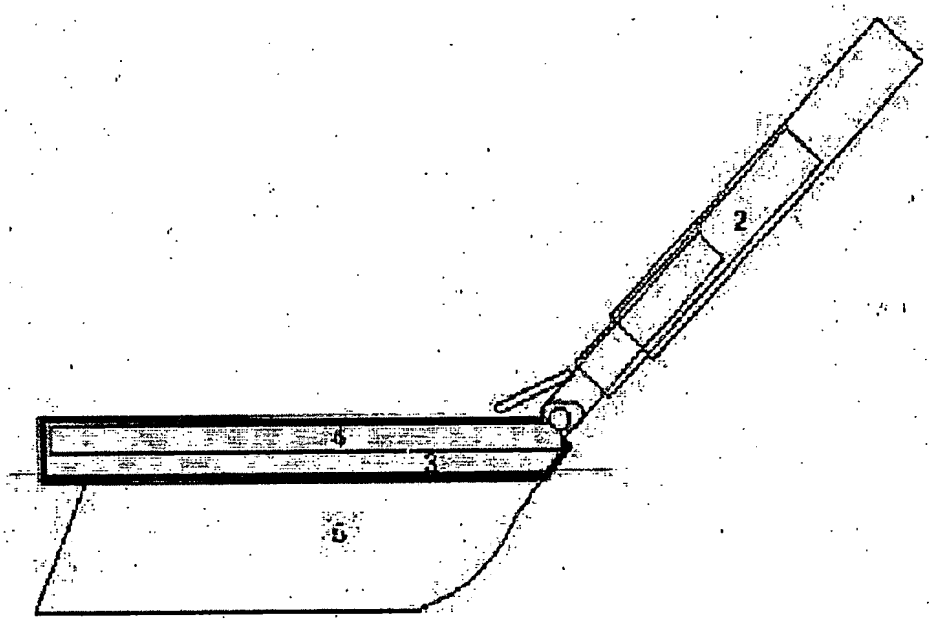
14. Said handling system is capable of incorporating third party analytical equipment into hermetically-sealed modules and communication with wireless, hard, optical or other links to remote data bases for the purposes of cross-referencing objects or persons of interest with on-board sensor results.

15. A lift cable that is attached to the boom and can be reeled in or out. The other end is attached to a uniquely configured sliding attachment, which is part of a positive traction slide rail mechanism on the SSVHS. During predock and docking, the lift cable/ sliding attachment is positioned at the nose (front) of the SSVHS. During the docking, the locking mechanism engages and locks, the cable/sliding attachment travels up the positive traction rail mechanism to a point centered over the center of gravity of the SSVHS and contents. The cable sliding attachment then locks in place and the assembly can be lifted aboard ship. Slide can be passive or actively driven by electrical, hydraulic or pneumatic means.





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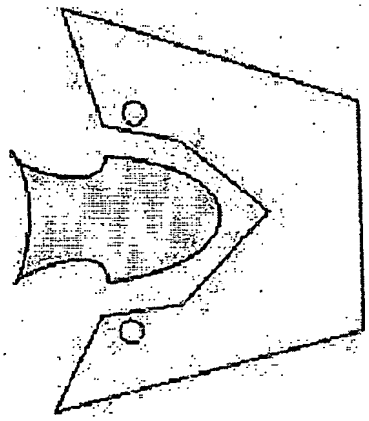
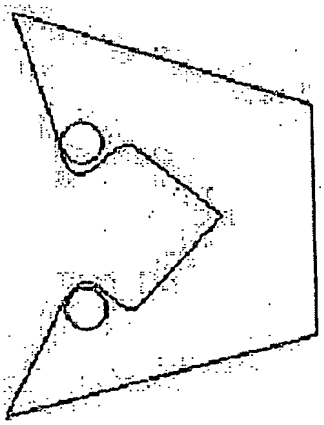
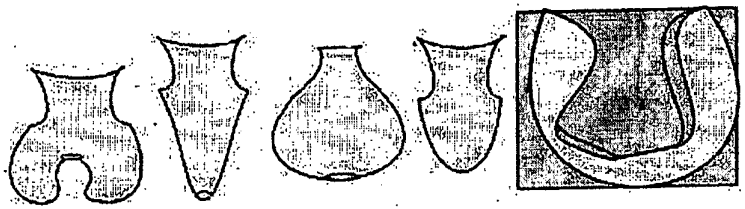
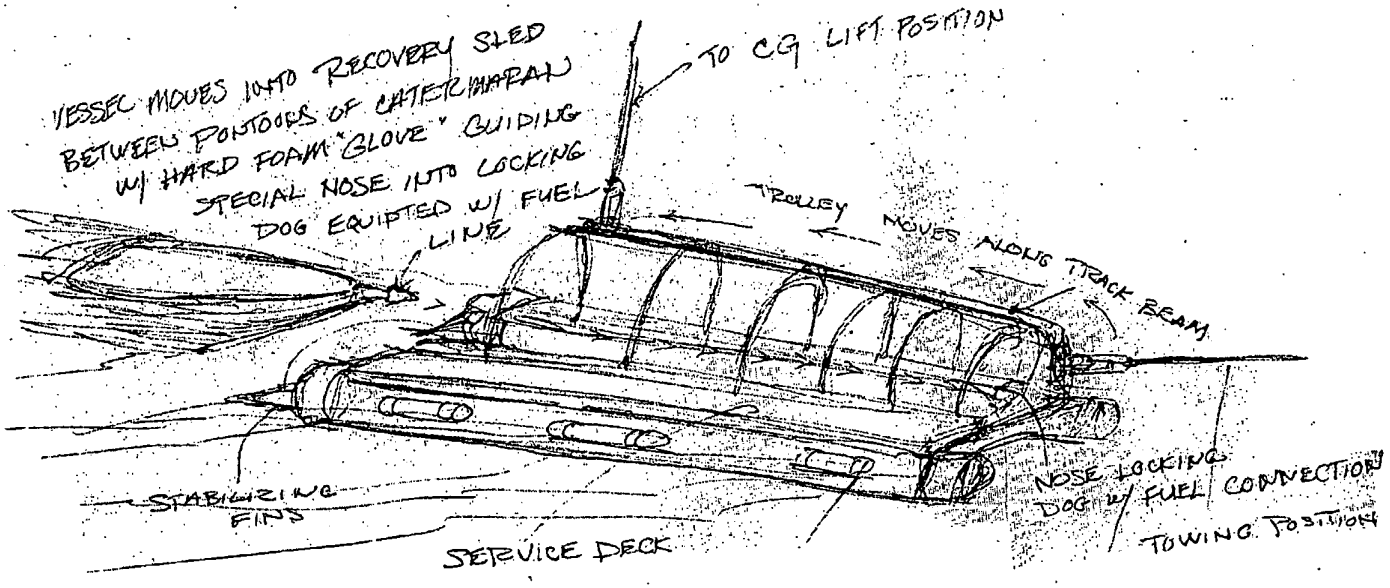
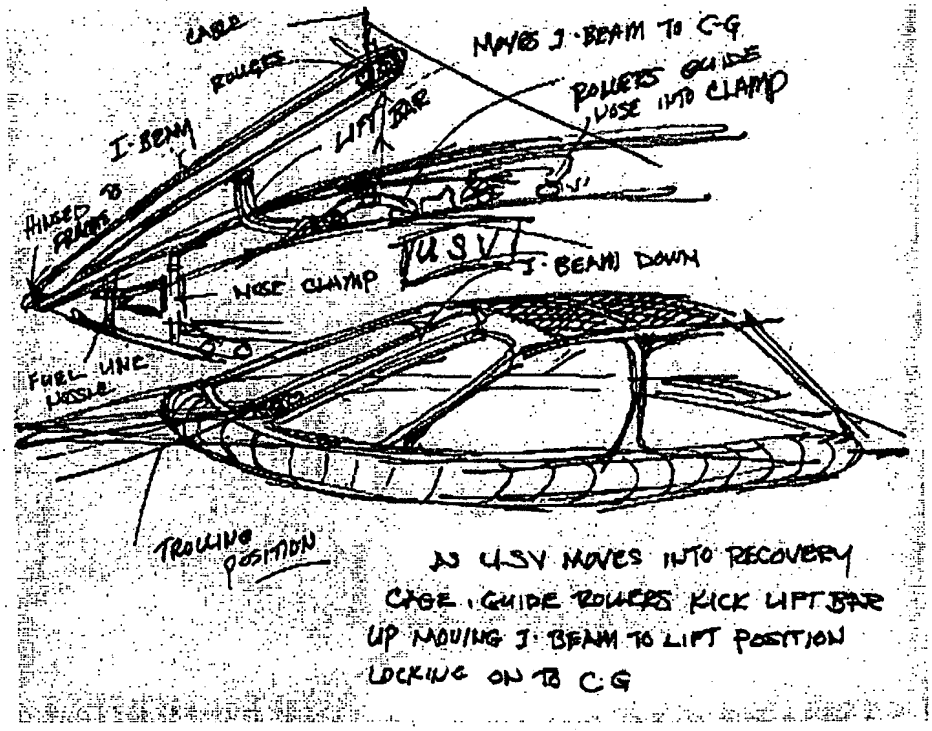
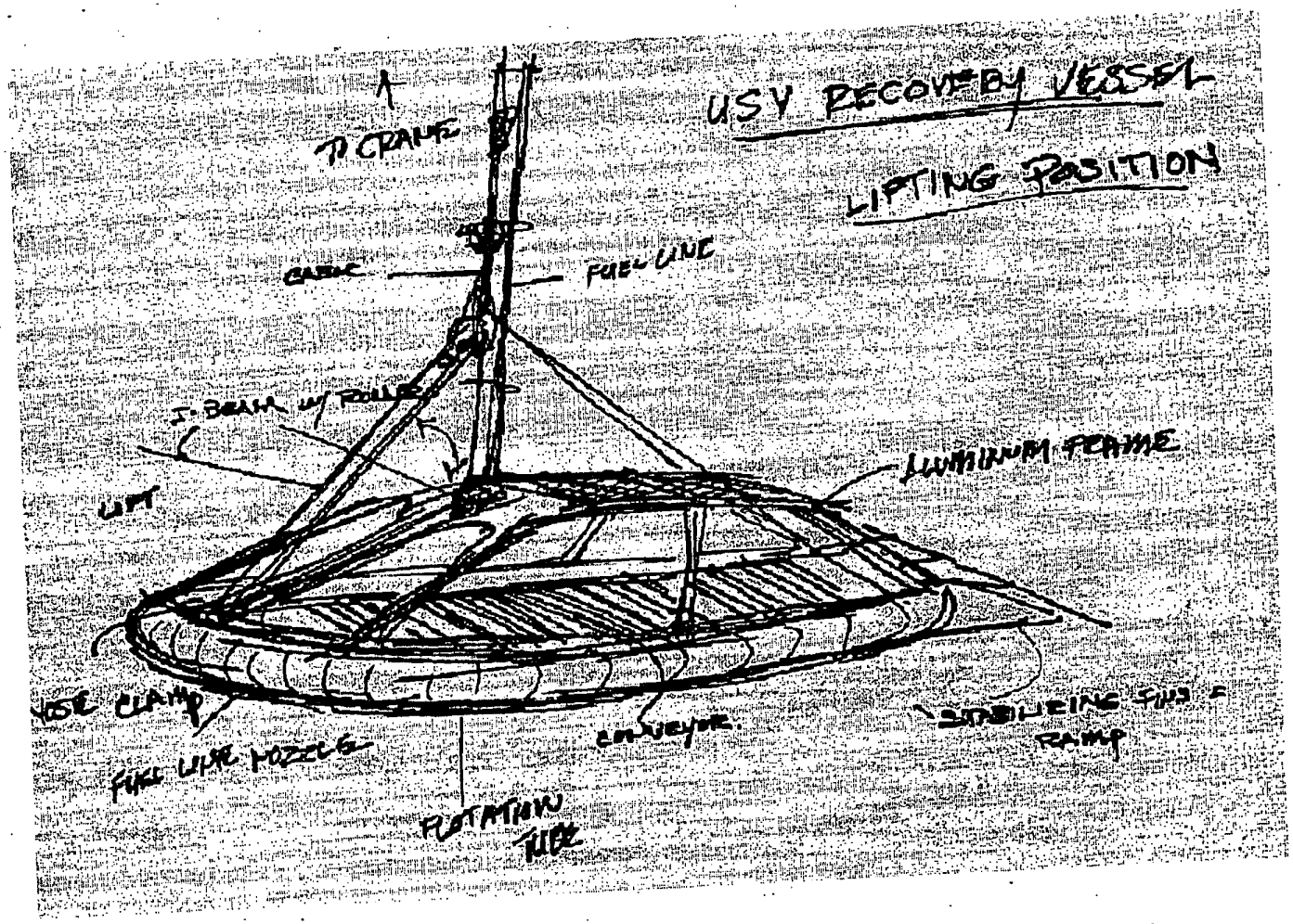


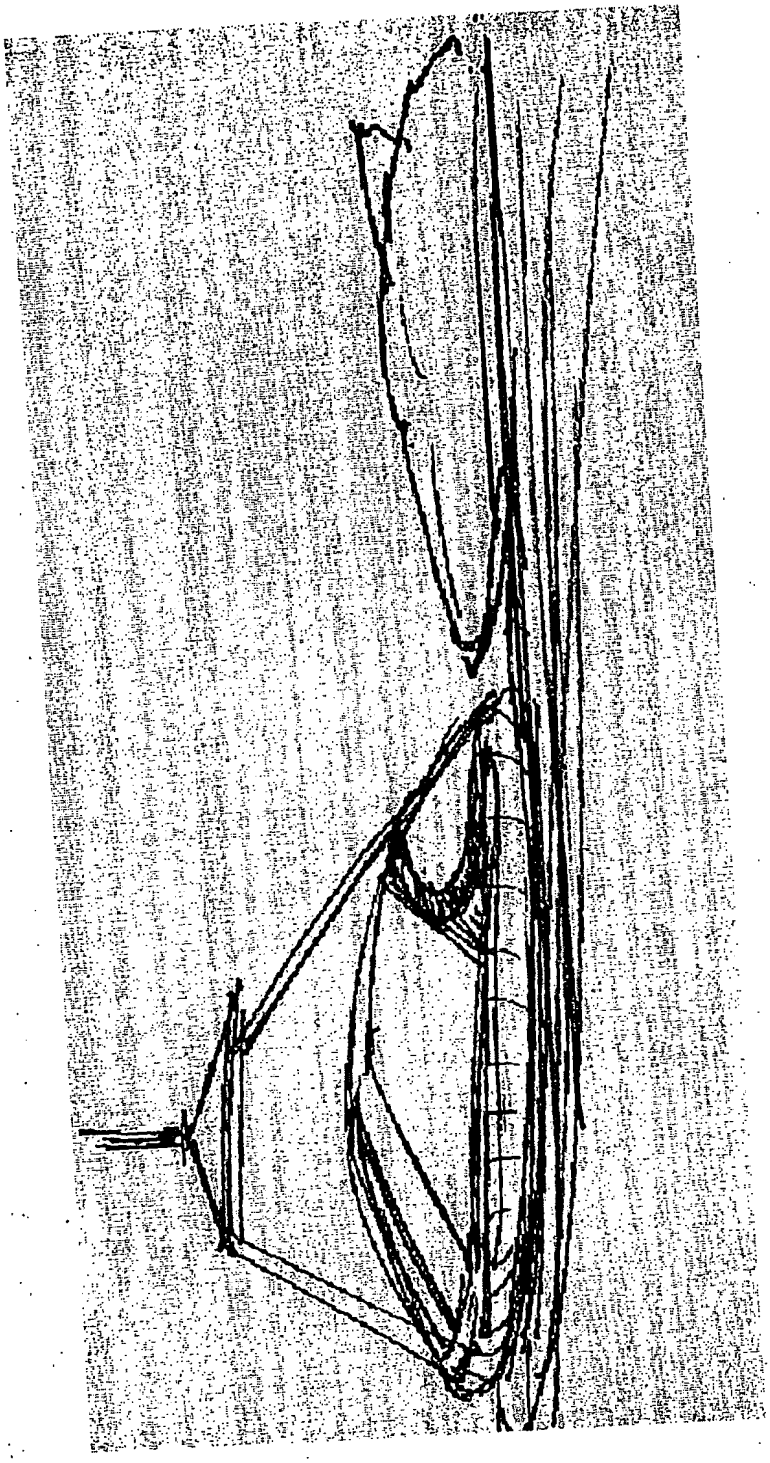


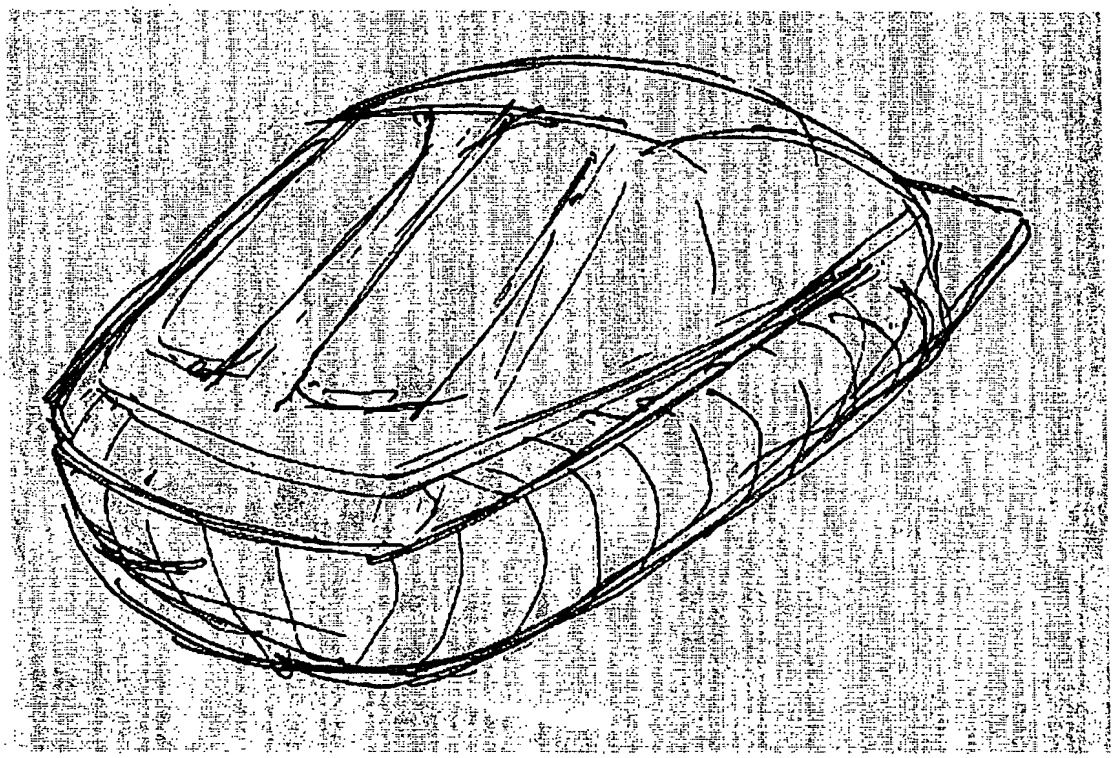


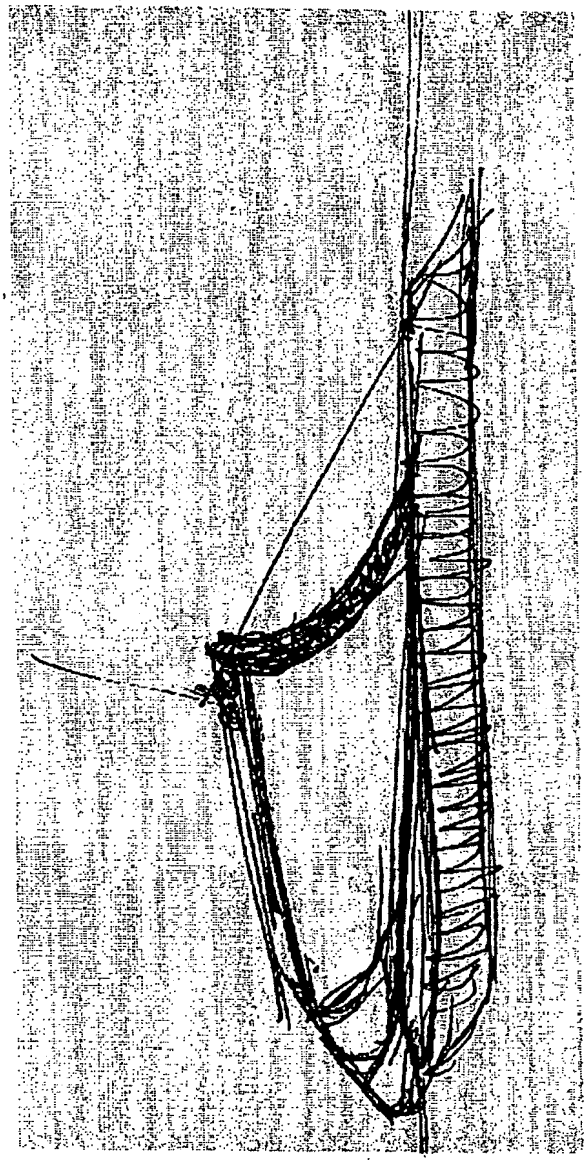

VESSEL MOVES INTO RECOVERY SLED BETWEEN PONTOONS OF CATERMARAN W/ HARD FOAM "GLOVE" GUIDING SPECIAL NOSE INTO LOCKING DOG EQUIPTED W/ FUEL LINE
TO CG LIFT POSITION
TROLLEY MOVES ALONG TRACK BEAM
STABILIZING FINS
SERVICE DECK
NOSE LOCKING DOG W/ FUEL CONNECTION
TOWING POSITION
STRUCTURAL CASE
PONTOONS W/ INTERNAL BUOYANCY
STABILIZING

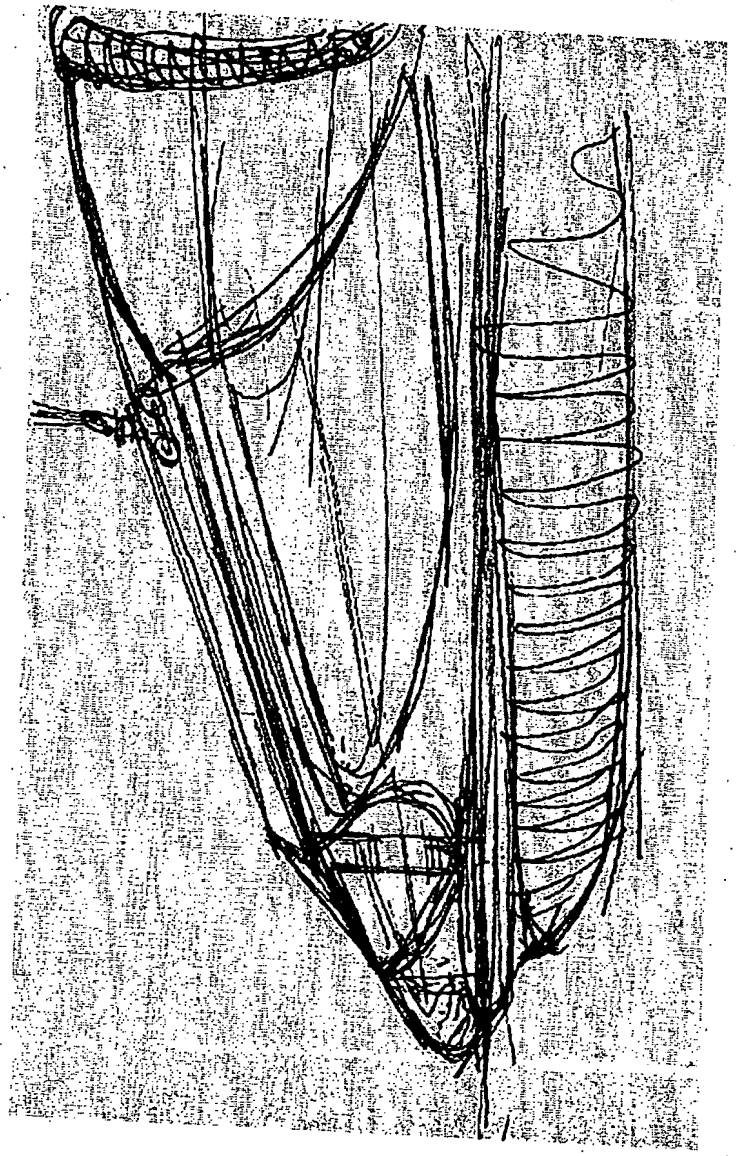

CABLE
ROLLERS
I-BEAM
LIFT BAR
MOVES I-BEAM TO C-G
ROLLERS GUIDE HOSE INTO CLAMP
HINGED FRAME
HOSE CLAMP
USV
I-BEAM DOWN
FUEL LINE HOSE
TROLLING POSITION
AS USV MOVES INTO RECOVERY CAGE, GUIDE ROLLERS KICK LIFT BAR UP MOVING I-BEAM TO LIFT POSITION LOCKING ON TO C.G

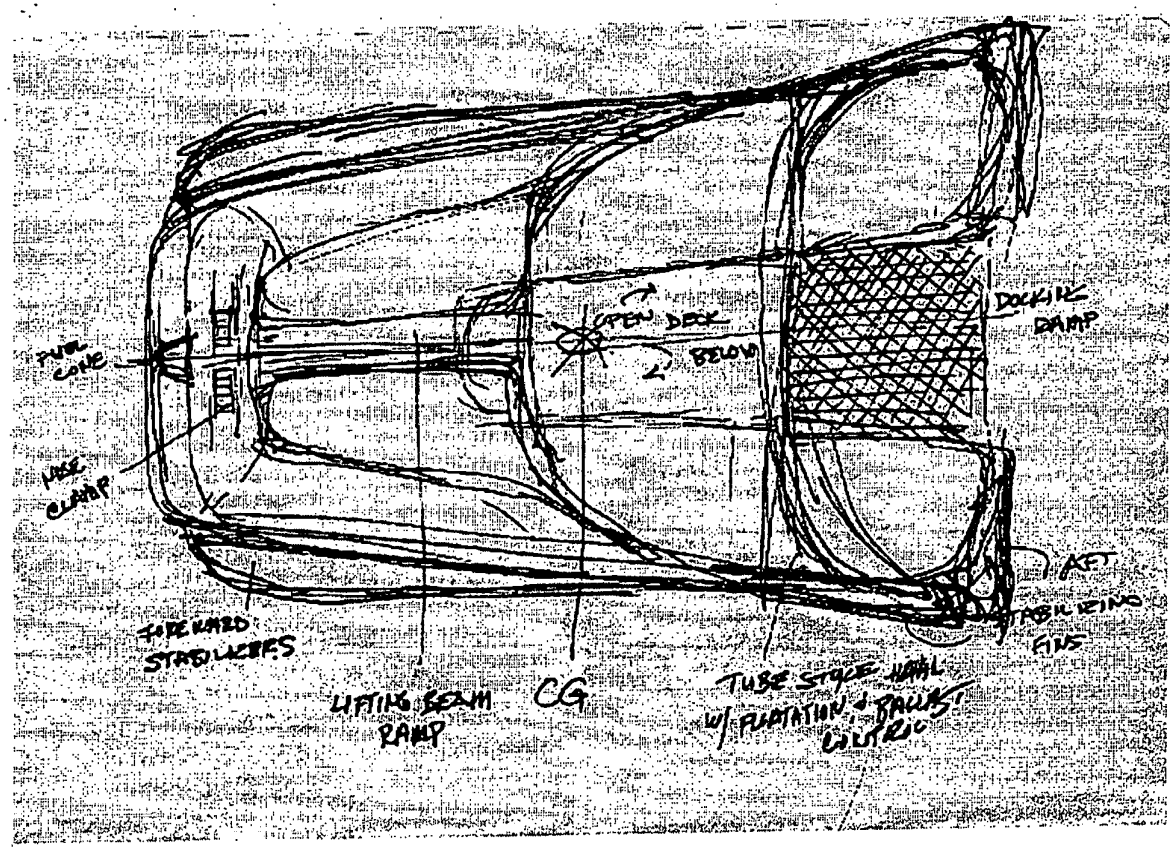

USV RECOVERY VESSEL
LIFTING POSITION
A-FRAME
CABLE
FUEL LINE
I-BEAM w/ ROLLER
LIFT
ALUMINUM FRAME
HOSE CLAMP
FIRE LINE NOZZLE
CONVEYOR
FLOTATION TUBE
RAMP

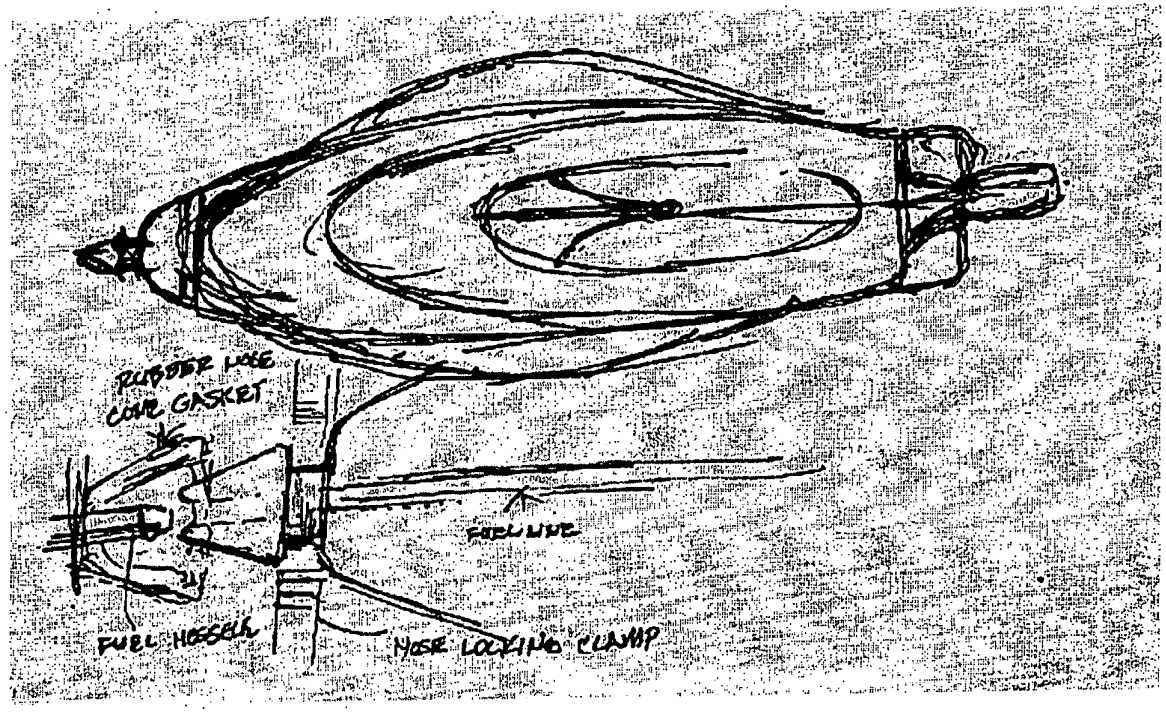


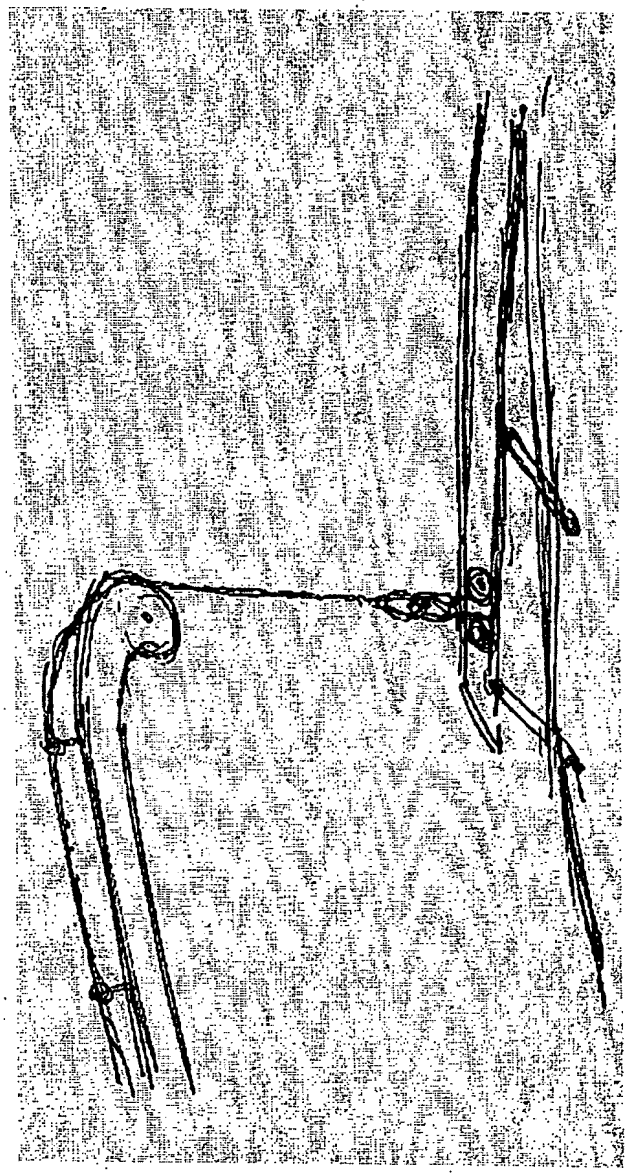


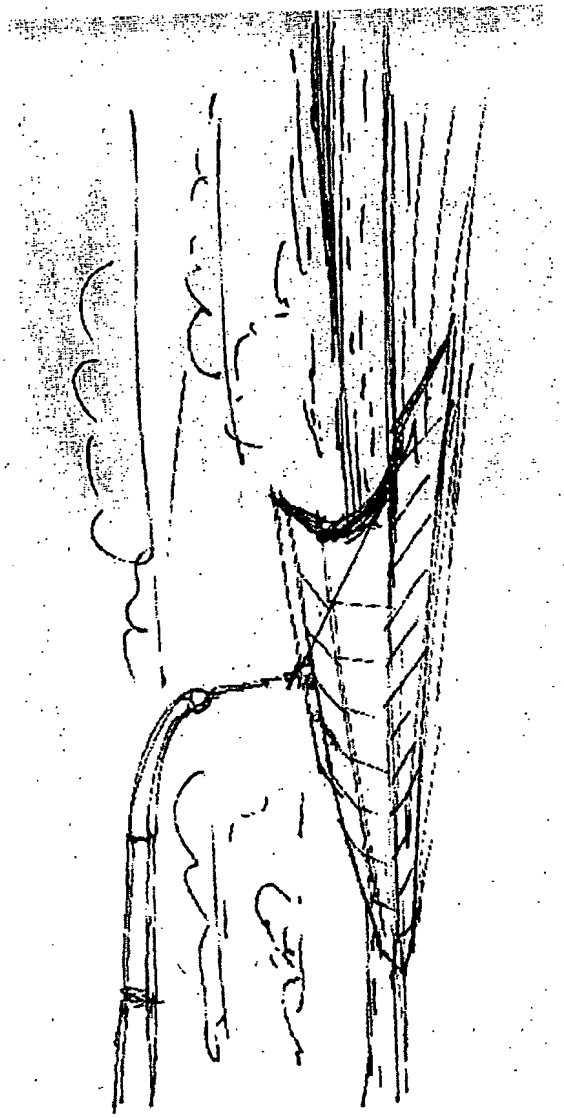


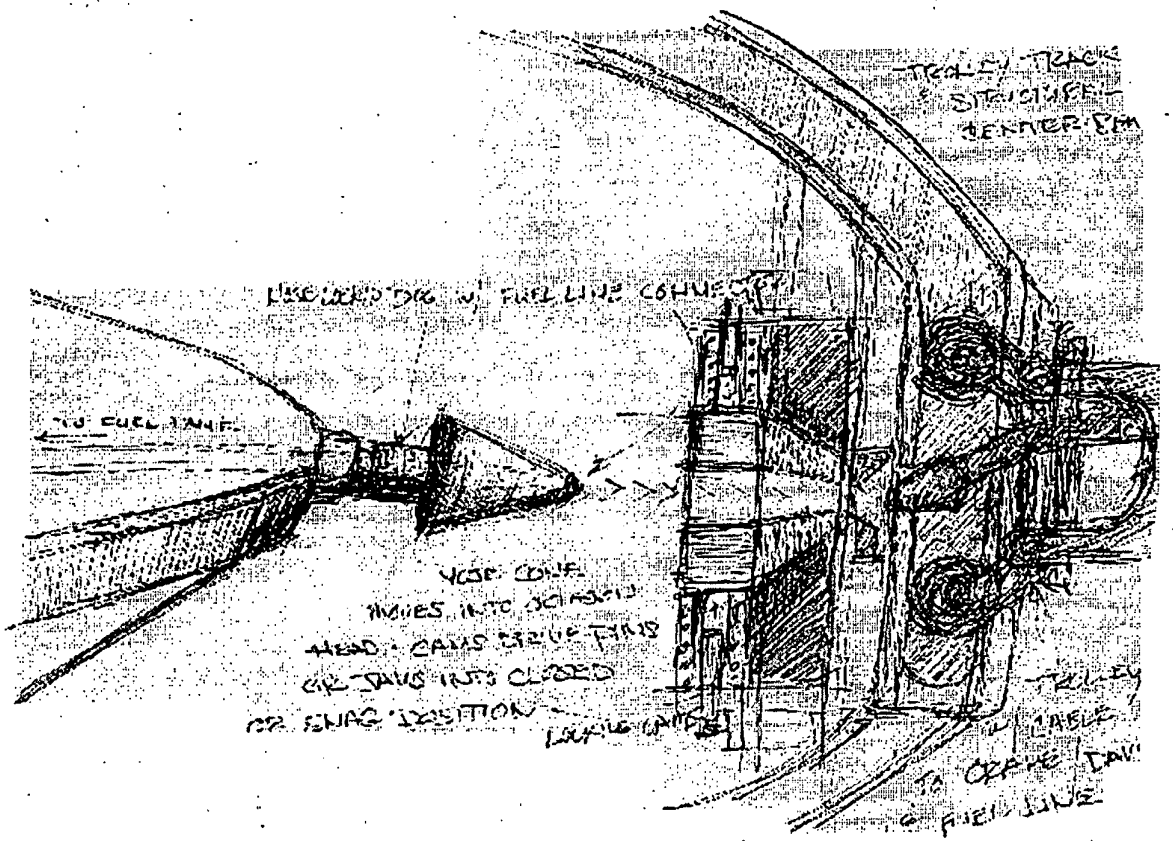



OPEN DECK
BELOW
DOCKING RAMP
PIVOT CONE
HOSE CLAMP
AFT
FABRICATED FINS
FABRICATED STABILIZERS
LIFTING BEAM
RAMP
CG
TUBE STYLE HULL
W/ FLOTATION & BALLAST


RUBBER HOSE
COVR GASKET
FUEL LINE
FUEL HOSE
HOSE LOCKING CLAMP



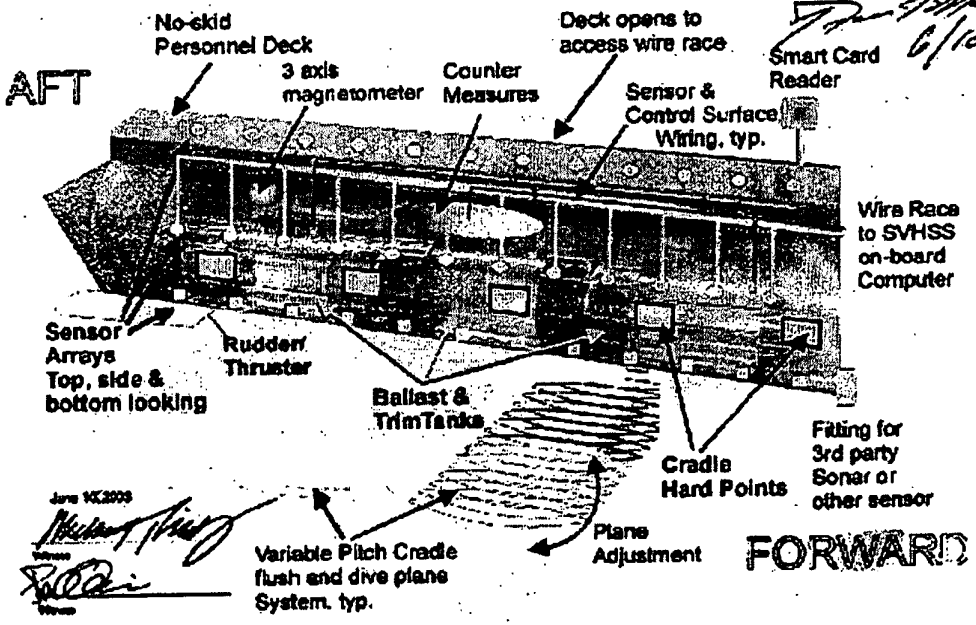


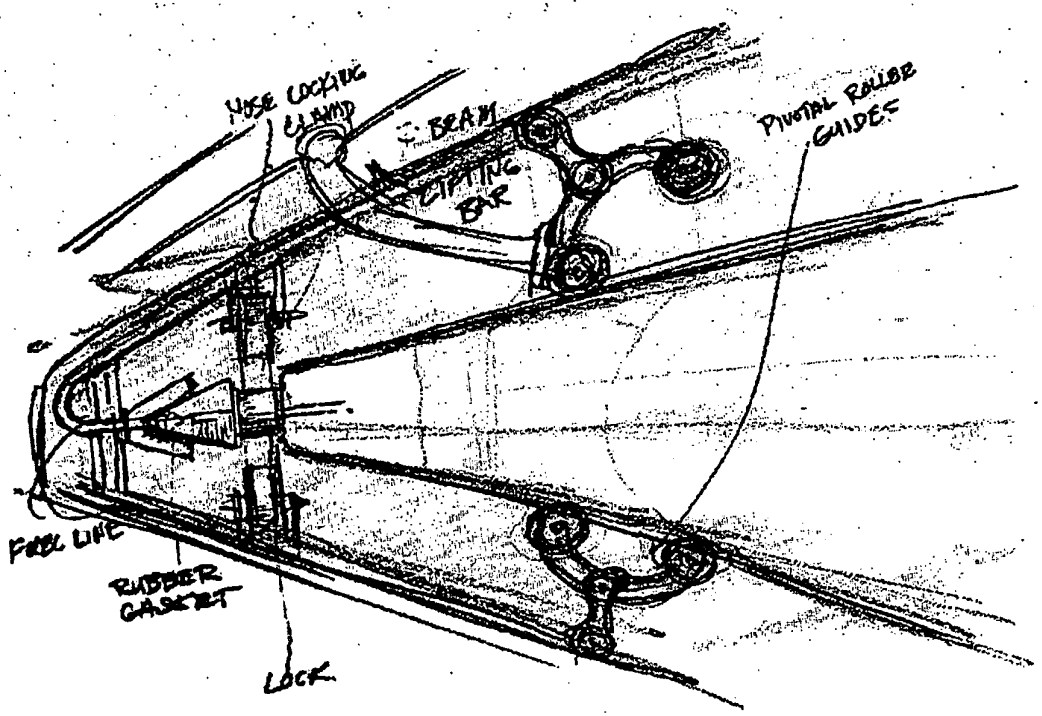

TROLLEY TRACK
CENTER LINE
TO FUEL LINE
TO OPPOSITE DAM
FUEL LINE

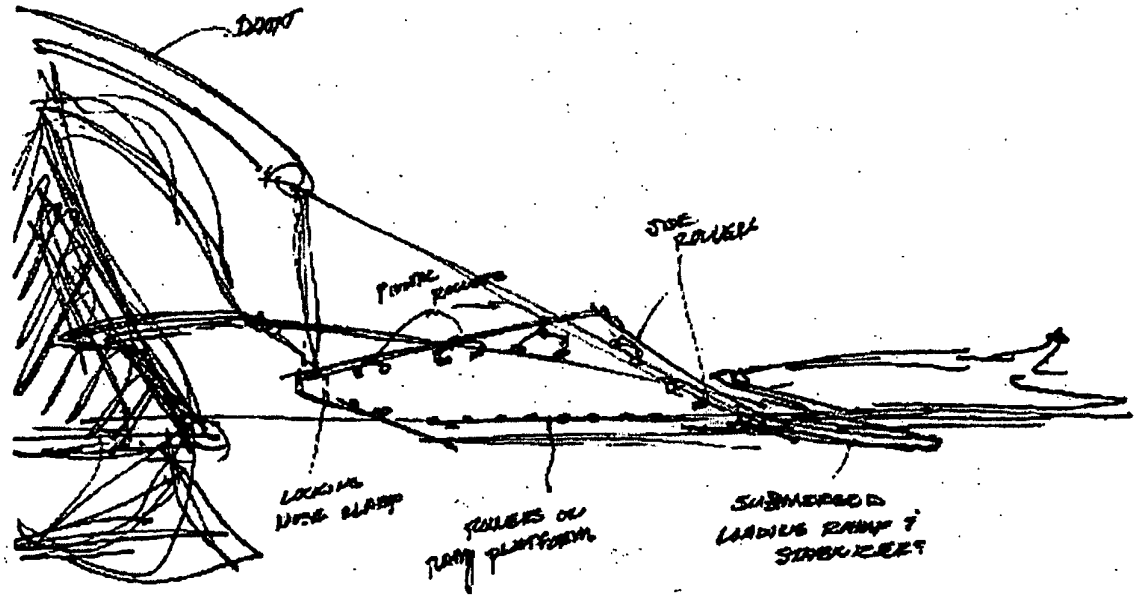
Ship's Small Vessel Handling System (SSVHSL)

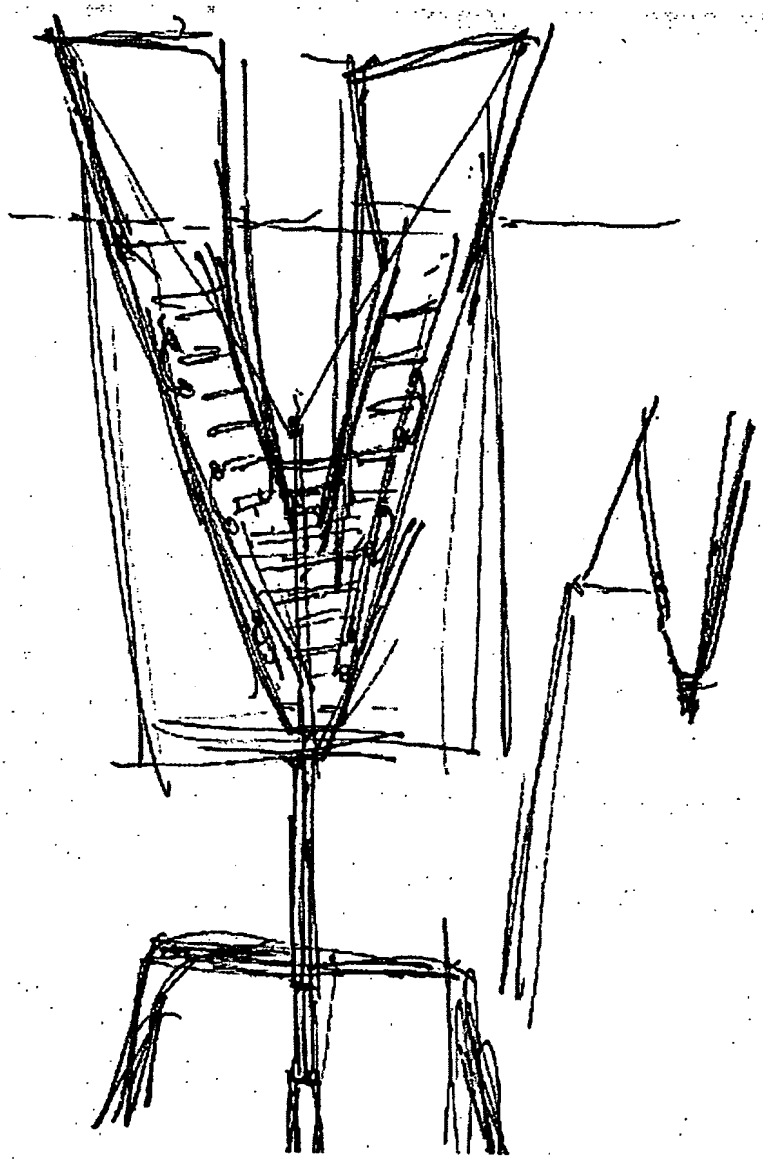
Pontoon Details

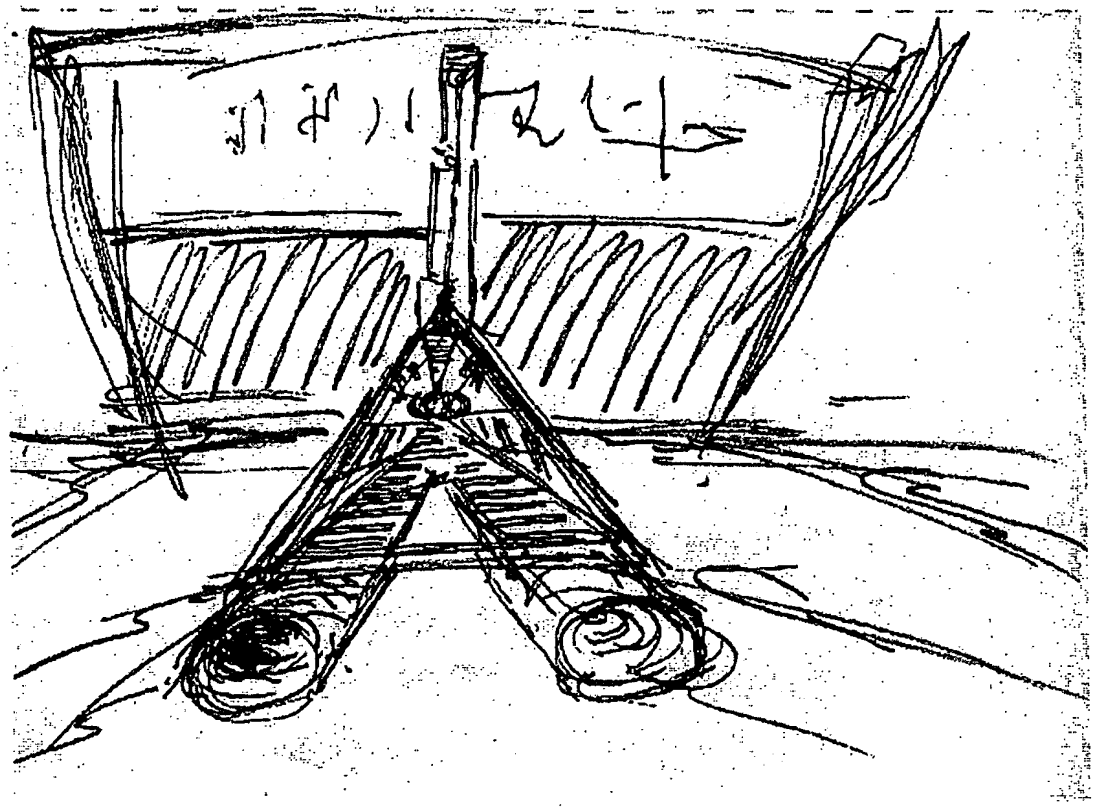
6/10/05

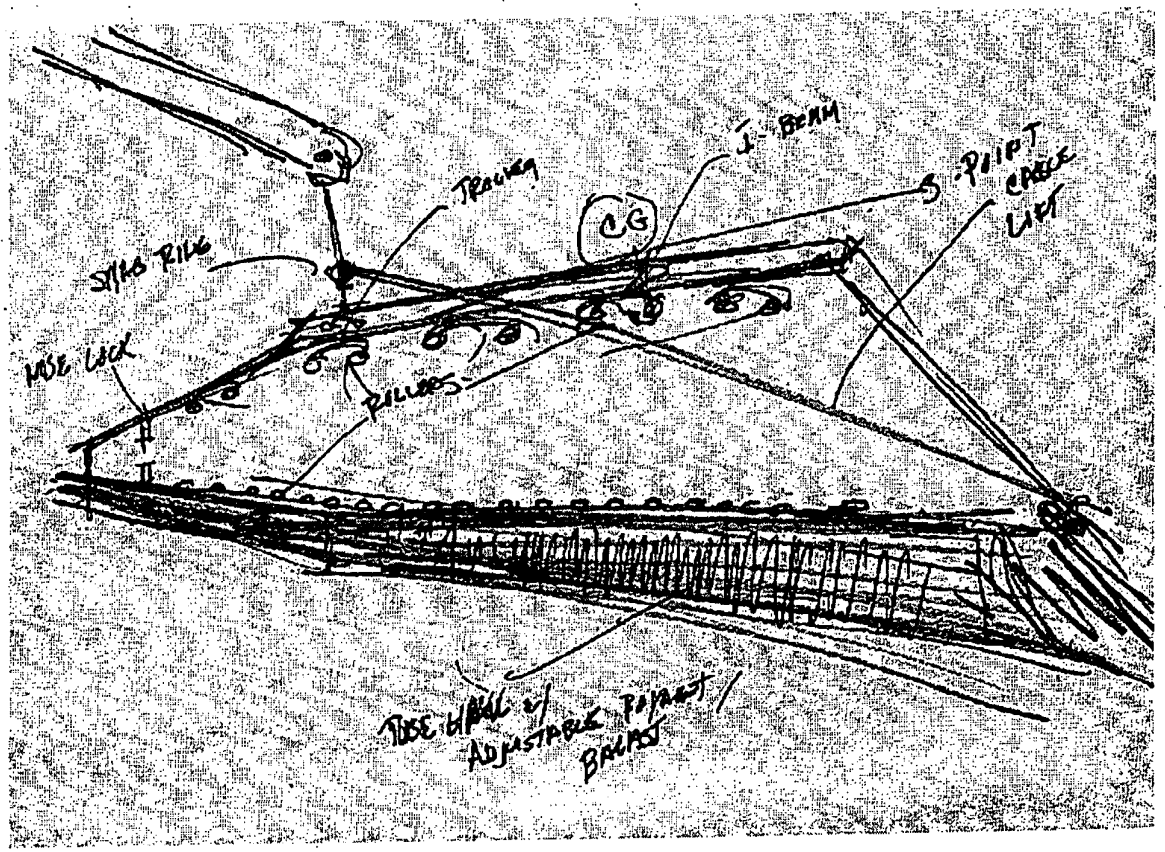


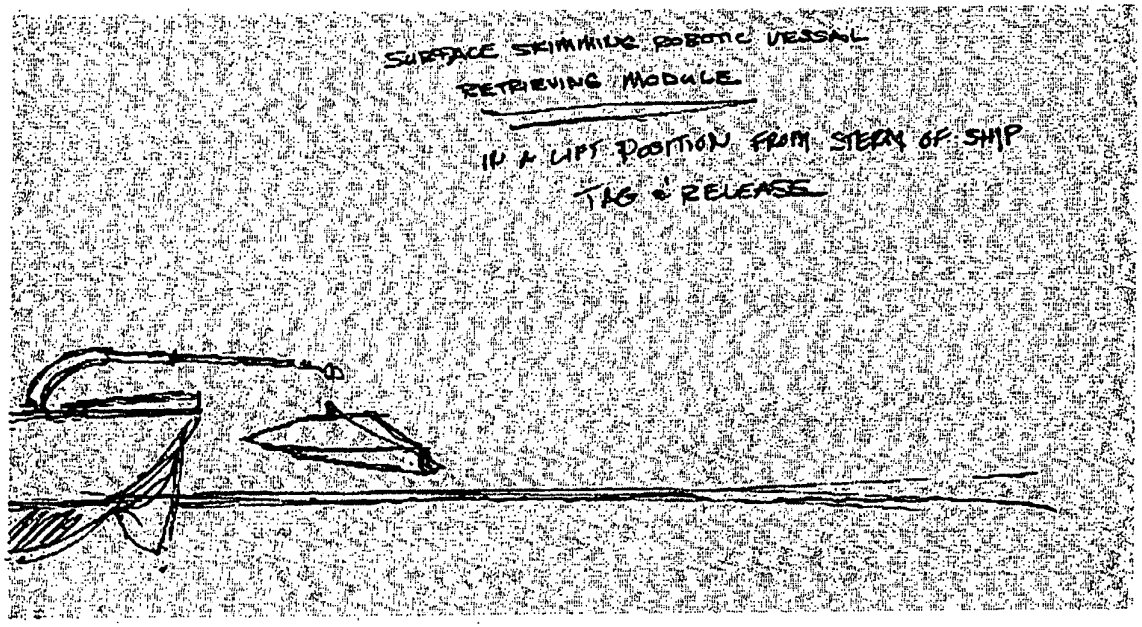

HOSE LOCKING CLAMP
BRASS LIFTING BAR
PIVOTAL ROLLER GUIDES
FUEL LINE
RUBBER GASKET
LOCK


DOOR
SIDE ROLLER
LOCKING
ROLLERS ON
SUBMERGED
LANDING RAMP &






I-BEAM
TRAILING
CG
PILOT CABLE LIFT
STRAP RING
NOSE LOCK
PULLEYS
NOSE WEIGHT W/ ADJUSTABLE PAYLOAD BALLAST


SURFACE SKIMMING ROBOTIC VESSAL
RETRIEVING MODULE
IN A LIFT POSITION FROM STERN OF SHIP
TAG & RELEASE

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US04/019042

International filing date: 14 June 2004 (14.06.2004)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/484,753
Filing date: 03 July 2003 (03.07.2003)

Date of receipt at the International Bureau: 24 January 2005 (24.01.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse